1. A gate stack structure situated over a base semiconductor material layer, said gate stack structure comprising:

a gate oxide layer on said base semiconductor material layer;

a gate layer, composed of a first conductive material, on said gate oxide layer;

a layer of refractory metal silicide on said gate layer;

an undoped silicon dioxide cap on said layer of refractory metal silicide;

a spacer over a lateral side of the gate layer and in contact with said base semiconductor material layer, said spacer being composed of a nonconductive material, wherein the lateral side of the gate layer is oriented perpendicular to said base semiconductor material layer;

a contact plug in contact with said base semiconductor material layer composed of a second conductive material, and being situated adjacent to the gate layer; and

a layer of doped silicon dioxide over said spacer, over said undoped silicon dioxide cap, and in contact with said contact plug.

2. The gate stack structure as recited in Claim 1, wherein said nonconductive material is composed of silicon nitride.

3. The gate stack structure as recited in Claim 1, wherein:

said nonconductive material is composed of undoped silicon dioxide; and

the spacer is integral with the undoped silicon dioxide cap.

4. The gate stack structure as recited in Claim 1, wherein the semiconductor material is monocrystalline silicon.

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5. The gate stack structure as recited in Claim 1, wherein said refractory metal silicide layer is tungsten silicide.

6. The gate stack structure as recited in Claim 1, wherein said layer of doped silicon dioxide layer is composed of a material selected from the group consisting of BPSG, PSG, and BSG.

7. The gate stack structure as recited in Claim 1, wherein the spacer is composed of a material that is one of silicon nitride and undoped silicon dioxide.

8. The gate stack structure as defined in Claim 1, wherein the first conductive material is polysilicon.

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9. A gate stack structure situated over a base monocrystalline silicon layer, said gate stack structure comprising:

a gate oxide layer on said base monocrystalline silicon layer;

a polysilicon gate layer on said gate oxide layer;

a layer of tungsten silicide on said polysilicon gate layer;

an undoped silicon dioxide cap on said layer of tungsten silicide;

a spacer over a lateral side of the gate layer and in contact with said base monocrystalline silicon layer, said spacer being composed of undoped silicon dioxide and being integral with the undoped silicon dioxide cap, wherein the lateral side of the gate layer is oriented perpendicular to said base monocrystalline silicon layer;

a contact plug in contact with said base monocrystalline silicon layer and being:

composed of a second conductive material; and

situated adjacent to the gate layer; and

a layer of doped silicon dioxide being composed of a material selected from the group consisting of BPSG, PSG, and BSG, and being situated over said spacer, over said undoped silicon dioxide cap, and in contact with said contact plug.

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10. A gate stack structure situated over a base monocrystalline silicon layer, said gate stack structure comprising:

a gate oxide layer on said base monocrystalline silicon layer;

a polysilicon gate layer on said gate oxide layer;

a layer of tungsten silicide on said polysilicon gate layer;

an undoped silicon dioxide cap on said layer of tungsten silicide;

a spacer over a lateral side of the gate layer and in contact with said base monocrystalline silicon layer, said spacer being composed of of a material that is one of silicon nitride and undoped silicon dioxide and being integral with the undoped silicon dioxide cap, wherein the lateral side of the gate layer is oriented perpendicular to said base monocrystalline silicon layer;

a contact plug in contact with said base monocrystalline silicon layer and being:

composed of a second conductive material; and

situated adjacent to the gate layer; and

a layer of doped silicon dioxide being composed of a material selected from the group consisting of BPSG, PSG, and BSG, and being situated over said spacer, over said undoped silicon dioxide cap, and in contact with said contact plug.

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11. A gate structure comprising:

a pair of gate stacks situated over a base semiconductor material layer, each said gate stack comprising:

a gate oxide layer on said base semiconductor material layer;

a gate layer, composed of a first conductive material, on said gate oxide layer;

a layer of refractory metal silicide on said gate layer;

an undoped silicon dioxide cap on said layer of refractory metal silicide; and

a spacer in contact with a lateral side of each said gate stack and with said base semiconductor material layer, said spacer being composed of a nonconductive material, each said lateral side of each said gate stack being perpendicular to said base semiconductor material layer;

a contact plug in contact with said base semiconductor material layer composed of a second conductive material, and being situated between said pair of gate stacks; and

a layer of doped silicon dioxide over said spacer, over said undoped silicon dioxide cap, and in contact with said contact plug.

12. A gate structure as recited in Claim 11, wherein said nonconductive material is composed of silicon nitride.

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13. The gate structure as recited in Claim 11, wherein:

said nonconductive material is composed of undoped silicon dioxide; and

each said spacer is integral with a respective one of said undoped silicon dioxide caps.

14. A process as recited in Claim 11, wherein the semiconductor material is monocrystalline silicon.

15. A process as recited in Claim 11, wherein said refractory metal silicide layer is tungsten silicide.

16. A process as recited in Claim 11, wherein said layer of doped silicon dioxide layer is composed of a material selected from the group consisting of BPSG, PSG, and BSG.

17. A process as recited in Claim 11, wherein the spacer is composed of a material that is one of silicon nitride and undoped silicon dioxide.

18. A gate structure as defined in Claim 11, wherein the first conductive material is polysilicon.

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19. A gate structure comprising:

a pair of gate stacks situated over a base monocrystalline silicon layer, each said gate stack comprising:

a gate oxide layer on said base monocrystalline silicon layer;

a polysilicon gate layer on said gate oxide layer;

a layer of tungsten silicide on said polysilicon gate layer;

an undoped silicon dioxide cap on said layer of tungsten silicide; and

a spacer over a lateral side of each said gate stack and in contact with said base monocrystalline silicon layer, said spacer being composed of undoped silicon dioxide and being integral with the undoped silicon dioxide cap, wherein the lateral side of each said gate stack is oriented perpendicular to said base monocrystalline silicon layer;

a contact plug in contact with said base monocrystalline silicon layer and being composed of a second conductive material, and being situated between said pair of gate stacks; and

a layer of doped silicon dioxide over said spacer, over said undoped silicon dioxide cap, and in contact with said contact plug.

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20. A gate structure comprising:

a pair of gate stacks situated over a base monocrystalline silicon layer, each said gate stack comprising:

a gate oxide layer on said base monocrystalline silicon layer;

a polysilicon gate layer on said gate oxide layer;

a layer of tungsten silicide on said polysilicon gate layer;

an undoped silicon dioxide cap on said layer of tungsten silicide; and

a spacer over a lateral side of each said gate stack and in contact with said base monocrystalline silicon layer, said spacer being composed of a material that is one of silicon nitride and undoped silicon dioxide, each said lateral side of each said gate stack being perpendicular to said base monocrystalline silicon layer;

a contact plug in contact with said base monocrystalline silicon layer and being composed of a second conductive material, and being situated between said pair of gate stacks; and

a layer of doped silicon dioxide over said spacer, over said undoped silicon dioxide cap, and in contact with said contact plug.

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